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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,546	10/02/2003	Mohammad Jaber Borran	873.0129.U1(US)	2515

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EXAMINER	
JOSEPH, JAISON	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

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Supplemental Notice of Allowability	Application No. 10/678,546	Applicant(s) BORRAN ET AL.	
	Examiner Jaison Joseph	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to _____.

2. ☒ The allowed claim(s) is/are *1-23*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 02/26/2006 was filed after the mailing date of the Notice of Allowance on 02/21/2006. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

The telephonic conversation with the applicant on 04/25/2006 regarding the Falzon reference, applicant argue that "Falzon is directed to data compression using orthogonal or bi-orthogonal base functions such as wavelets. Falzon uses a Kullback-Leibler (KL) distance to estimate the parameters of a generalized Gaussian distribution, which in turn is used as a probability density model of the image-compression sub-bands. Falzon is not seen as relevant to signal constellations, but to data compression. Claims 2 and 12 recite that a KL distance (or an expected KL distance) separates certain points of one subset of a signal constellation, where the subset is selected from at least two mutually exclusive subsets.

Falzon is directed toward data compression, not signal constellations to which that data might later be mapped. At paragraph [0024], Falzon uses a minimized KL distance for estimating parameters of a generalized Gaussian model to minimize the cost of coding. The 'cost' of coding is distortion, as described in paragraph [0023] where an optimized quantization step is deduced from rate and distortion graphs (e.g., higher coding rate yields greater distortion, so an optimum mix is to be found that results in coding rate and image distortion each at an acceptable level). The KL

distance in Falzon, as detailed at paragraph. [0053], is that distance between a generalized Gaussian distribution of parameters a and b, and an empirical distribution. Figures 2 and 3 of Falzon show how rate and distortion, respectively, depend from the parameter b; and paragraph [0081] shows the relation between b and a. Falzon's KL distance is between distributions p_1 and p_2, of which p_1 is the empirical distribution and p_2 is the Gaussian distribution (see paragraphs. [0069] to [0071]) having parameters a and b. Falzon uses these distributions p_1 and p_2 to optimize rate versus distortion in compressing image data.

Whether or not the image data is compressed or not is not particularly relevant to any signal constellation that the data might be mapped to, but if compressed data is to be transmitted, then Falzon teaches that where the transmission channel imposes a bit rate, Falzon's data compression may use that external bit-rate constraint in how it selects the parameters a and b so as to minimize distortion within that bit-rate constraint (distortion being the only variable left to optimize). See para. [0013].

Data compression and data mapping to a signal constellation are two very different operations. Image data may be compressed by Falzon and stored without being transmitted; image data may be mapped to a signal constellation and transmitted without being compressed. Falzon is not directed to selecting points of a signal constellation as in claims 2 and 12, but to compressing image data. Different resolution in the data compression necessarily yields different coding rates (see, for example, Falzon para. [0007] to [0008] and Fig 1) because fewer bits are needed to represent a

lower resolution of an image than a higher resolution. But coding data by compressing resolution is not analogous to mapping bits to a signal constellation.

Falzon describes a device at paragraph. [0141] to [0145] that compresses his image data and outputs from a buffer memory 30 compressed data at a rate R_c. The described functional blocks of Falzon's Fig. 4 are seen as insufficient to prepare the output of that buffer memory 30 for wireless transmission, because the data is not mapped to a signal constellation. Falzon is not seen to use KL distance between constellation points or to teach any subject matter relevant to the relative disposition of constellation points; Falzon uses a KL distance as a technique to find an optimum combination of rate and distortion by which to compress data."

Examiner agrees to the applicant's argument. Therefore, claims 2 and 12 are novel and unobvious over prior art of record.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Gerald Stanton on 01/13/2006.

The application has been amended as follows:

In the specification, page 5, lines 21 change "... U.S. Patent Application No. [XX/XXXXXX],..." to "...U.S. Patent Application No. 10/607406,..." .

Claim 1 rewrite as: A method for encoding a plurality of bits, comprising:

based on a plurality of bits, selecting one of at least two mutually exclusive subsets of a signal constellation and a point within said selected subset;

modulating the selected point using a carrier waveform; and

transmitting the modulated point,

wherein the selected subset includes at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which the modulated point is transmitted.

Claim 4 rewrite as: A method for encoding a plurality of bits, comprising:

based on a plurality of bits, selecting , based on a plurality of $m=k_1+k_2$ of bits, using k_1 of the bits to select one of at least two mutually exclusive subsets of a signal constellation and using k_2 of the bits to select a point within said selected subset, wherein m, k_1, k_2, are non-zero integers; and

modulating the selected point using a carrier waveform, wherein the selected subset includes at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which the modulated point is to be transmitted, and

wherein using k_1 of the bits to select said subset comprises encoding the k_1 bits into encoded bits, and selecting one of 2^n mutually exclusive subsets with the n encoded bits, wherein n is greater than k_1.

Claim 7, rewrite as: A method for encoding plurality of bits, comprising:

based on a plurality of bits, selecting one of at least two mutually exclusive subsets of a signal and a point within said selected subset;

modulating the selected point using a carrier waveform; and

transmitting the modulated point,

wherein the selected subset includes at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel which the modulated point is transmitted, and wherein the constellation points define concentric circles, and every point lying within a circle is from a different subset from every other point lying on that circle.

Claim 11 rewrite as: A transmitter for transmitting a series of input bits comprising:

an encoder having an input for receiving a plurality of input bits;

a mapper having an output coupled to an output of the encoder;

a computer-readable medium storage coupled to the mapper for storing at least one signal constellation;

a modulator having an input coupled to an output of the mapper; and

a transmit antenna having an input coupled to an output of the modulator,

wherein the mapper selects a subset of said signal constellation and a point within the selected subset based on the plurality of input bits, said selected subset including at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which a signal from the transmit antenna is to be transmitted.

Claim 14 rewrite as: A transmitter for transmitting a series of input bits comprising:

an encoder having an input for receiving a plurality of input bits;

a mapper having an output coupled to an output of the encoder;

a computer-readable medium storage coupled to the mapper for storing at least one signal constellation;

a modulator having an input coupled to an output of the mapper; and

a transmit antenna having an input coupled to an output of the modulator,

wherein the mapper selects a subset of said signal constellation and a point within the selected subset based on the plurality of input bits, said selected subset including at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which a signal from the transmit antenna is to be transmitted, and wherein the encoder encodes k_1 of the bits into n encoded bits, and the mapper selects one of 2^n mutually exclusive subsets using the n encoded bits, wherein n is greater than k_1.

Claim 17 rewrite as: A transmitter for transmitting a series of input bits comprising:

an encoder having an input for receiving a plurality of input bits;

a mapper having an output coupled to an output of the encoder;

a computer-readable medium storage coupled to the mapper for storing at least one signal constellation;

a modulator having an input coupled to an output of the mapper; and

a transmit antenna having an input coupled to an output of the modulator,

wherein the mapper selects a subset of said signal constellation and a point within the selected subset based on the plurality of input bits, said selected subset including at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which a signal from the transmit antenna is to be transmitted, and wherein the constellation points define concentric circles, and every point lying within a circle is from a different subset from every other point lying on that circle.

Claim 21 rewrite as: A method for encoding plurality of $m=k_1+k_2$ bits comprising:

selecting a subset of a signal constellation based on the k_1 input bits;

selecting a point within the selected subset based on the k_2 input bits, wherein at least two points within the selected subset are spaced from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which the selected point is to be transmitted ~~of at least one of said at least two points.~~ and

modulating the selected point using a carrier waveform,

wherein m, k_1, and k_2, are non-zero integers, and at least one of k_1 and k_2 are greater than one.

Claim 22 rewrite as: A method for encoding plurality of $m=k_1+k_2$ bits comprising:

selecting a subset of a signal constellation based on the k_1 input bits;

selecting a point within the selected subset based on the k_2 input bits, wherein at least two points within the selected subset are spaced from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which the selected point is to be transmitted ~~of at least one of said at least two points:~~ and

modulating the selected point using a carrier waveform,

wherein m, k_1, and k_2, are non-zero integers, and at least one of k_1 and k_2 are greater than one, and

wherein selecting a subset of a signal constellation based on the k_1 input bits comprises encoding the k_1 input bits into n encoded bits, and selecting one of 2^n subsets using the n encoded bits, wherein n is an integer greater than k_1 thet is derived from k_1 bits and a previously input plurality of bits.

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: Claims 1 – 23 are allowable over prior art of record. As per claims 1, 3 – 11, 13 – 19, and 21 – 23, the prior art of record failed to disclose a method and apparatus for encoding a plurality of

bits, comprising selecting one of at least mutually exclusive subsets of a signal constellation and a point within the selected subset wherein the selected subsets includes at least two constellation points that are separated from one another by a distance based on a conditional distribution that is a function of a characteristic of a channel through which the modulated point is transmitted, as claimed in the independent claim 1 and similar claimed subject matter in independent claims 4, 7, 11, 14, 17, 21, and 22. Thus claims 1, 3 – 11, 13 – 19, and 21 – 23 found novel and unobvious over prior art of record.

As per claims 2, 12, and 20, the prior art of record failed to disclose a method and apparatus for encoding a plurality of bits, comprising selecting one of at least mutually exclusive subsets of a signal constellation and a point within the selected subset wherein the selected subsets includes at least two constellation points that are separated from one another by one of Kullback-Leibler distance and an expected Kullback-Leibler distance as claimed in independent claim 2 and similar claimed subject matter in independent claim 12. Therefore, claims 2. 12 and 20 found novel and unobvious over prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jaison Joseph whose telephone number is (571) 272-6041. The examiner can normally be reached on M-F 9:30 - 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jaison Joseph
05/02/2006

DAC HA
PRIMARY EXAMINER